

# NEW PROPULSOR FOR COMMERCIAL AND MILITARY VESSELS

## COMBINING INBOARD RELIABILITY WITH OUTBOARD FLEXIBILITY

Durability and safety are essential factors especially for commercial and military vessels. Unfortunately most of the propulsion systems for smaller crafts are initially designed for pleasure craft.

There is a demand for reliability, the ability to use marinized automotive based diesel engines, fire safety and cabin heat. That spare parts are easy to come by are also of great importance. Combining the inboard reliability with the outboard flexibility and marrying them to a Diesel propulsor has been the goal and Holy Grail of the marine industry for decades.

Cimco Marine Diesel AB has now developed a unit that effectively achieves this!

It also meets or exceeds the:

- **NATO Single Fuel Directive**
- **Latest stringent emission standards**
- **Endurance demands on the commercial market**
- **Shock absorption capacity of the SOLAS market**

## THE NATO SINGLE FUEL DIRECTIVE

Most recently there is the requirement for governmental agencies to comply with the NATO single fuel directives in order to meet environmental demands that will become effective in 2015 and 2016 (IMO).

The combination of range, refueling procedures, crew safety and the geographical availability of diesel are all specifications required to be considered by the US Military, NATO and its allies into 2015. These specifications have however always been difficult to meet.

Cimco's OXE propulsor will be the only "outboard" on the market to meet this requirement.

## OUTBOARD BENEFITS

The flexibility, replaceability and maneuverability are often arguments that favor using an outboard propulsion system. Some of the most important advantages to outboard power are the fact that outboards can be tilted up to run in very shallow water and to keep out of water when at rest.

The outboard solutions also deliver a beneficial power-to-weight ratio and are mounted outside the hull, which significantly reduces the risk for water intrusion. Also when moored the engines can be trimmed out of the water which significantly reduces corrosion. Furthermore the outboard units can easily, and in a timely manner be replaced with a complete new unit, which gives the hull more time on water as power unit repairs can be performed elsewhere.

## SERVICE FRIENDLY FOR ONBOARD CREW

Easily accessible service points and service friendly units are still key for the onboard crew on commercial and governmental products. Distance to supplier's accessibility could be vast on the water and ability to repair units in a timely manner is critical.

Due to these critical environments any failure could be disastrous as currents and waves will take control when propulsion systems fail. Therefore products for governmental customers should be serviceable and allow for easy service and repair even in the most critical and the direst situations.

## BELT PROPULSOR UNITS, "BPU"

The Belt propulsor unit eliminates bevel gears and transfer shafts that are the weak links by utilizing latest belt technology. It allows for increased torque transfer to the propeller. It also allows for smaller torpedoes and slimmer submerged module. This provides less drag and thereby reduces fuel consumption and increases speed in comparable gear driven units.

From a safety aspect it is desirable that units allow for low engaging speed as well as being capable of crash stops, which significantly increases crew safety but further escalates the demand on the drive train.

## SELF-CONTAINED BELT PROPULSOR UNIT (S-BPU)

Self-containing units further reduce the down time and increase time on the water for the boat as they are easy to replace. This allows for services to be performed on land allowing the vessel to continue running on the water with a replaced unit. Finding ways to replace units in short time is important from this aspect.

It is also valuable to reduce the demand for cranes and other equipment required to remove the units from or through the hull. The outboards have a huge advantage compared to inboard solutions from this aspect.

## WHY IS AN S-BPU NOT A REGULAR OUTBOARD

An S-BPU is located on the transom of the vessel and it has a trim tilt system like most outboards do. This is where the commonalities end. An S-BPU is a modular platform that has a horizontal engine configuration in contrast to vertical engine installations.

The patented belt feature allows for fully scalable torque transfer capability without affecting the hydrodynamics. Using BPU technology makes it fully possible to build a very high powered S-BPU for high-speed crafts. The BPU is a new segment in the marine propulsion industry and not comparable to anything on the market today.

## THE OXE DIESEL S-BPU

The OXE Diesel is the first self-contained belt propulsor unit on the market. It has been designed to combine or exceed the benefits of the inboard stern drive solution with the benefits from the outboard solution. By using modular design the OXE has been built up with proven conventional technology but instead of utilizing bevel gears the whole system has been designed as a self-contained belt propulsor unit.

The key concept in the design phase has been to create a reliable, enduring product that run on diesel to comply with NATO single fuel policy and the environmental demands that the market has stipulated.

The power head is a GM, L4, 2.0-liter turbocharged automotive diesel engine that has been marinized with closed circuit coolant system inspired by modern inboard technology. This provides the unit with a well-proven engine that has been carefully tested over time with reliable technology.

The power-head has been redesigned to arrange all service point in front of the unit so that maintenance and service can be performed on the water. It has been fitted with a dry sump system to allow for rolling in heavy seas, tilting and trimming. The power unit has been mounted on the adaptor plate with four heavy-duty bushings to allow the unit to endure punishing commercial use.

## CHANGE OF THE GEAR RATIO

The power from the engine is transferred to the separate stand-alone gearbox via a primary belt system. The primary belt has been designed as the system fuse and adapter. It allows the user to change the gear ratio of the unit to fit various demands and driving styles. By changing the pulleys in the primary belt transition the users can change the gear ratios from 1.3 to 1.47 and 1.66.

## MULTI-PLATE-CLUTCH FOR CRASH STOPS

The gearbox, mounted separately under the engine is an electro- hydraulically operated system with two multi-plate-clutch packages that allows for high torque and power transfer and smooth seamless shifting between neutral, forward and reverse. It has been designed to withstand crash stops and clockwise and counter clockwise rotation so that the unit can replace right and left mounted units.

The use of a hydraulic multi plate clutch further provides the unit with low-speed capacity through controlled clutch slippage. This effectively allows the unit to seamlessly run from 1 rpm to the end of the rev range. By avoiding minimal running speed units can be used on most platforms and be given search and rescue or patrolling missions where low speed capacity is key as well as interception and transport missions where high speed is required.

## OXE DIESEL S-BPU CUSTOMER BENEFITS

Using BPU technology significantly reduces drag as it allows more slender design on the submerged modules. Also the technology reduces complexity and increases serviceability. All modules are separately serviceable and none of the service parts of the OXE Diesel S-BPU are submerged. The BPU technology contributes to that all shafts are horizontal. Engine, gearbox and propeller shaft are horizontal which reduces the unit vibrations.

The OXE design incorporates:

- **Reduced drag**
- **Increased serviceability**
- **Less vibrations**
- **Compliance with SOLAS demands**
- **Rigid construction**
- **Reduced fuel consumption**

The OXE Diesel S-BPU has been designed to comply with SOLAS demands. The rigid construction withstands great forces and is optimized for commercial use. It allows for long service hours and significantly reduces the fuel consumption compared with other propulsion system due to its slender submerged modules. It is easily reconfigured to fit the platform it is mounted on due to the changeable gear ratio and the hydraulic gearbox that allows for clockwise and counter clockwise rotation.

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